Washington State Department of Labor & Industries

Electrical Currents

Newsletter from the Office of the Chief Electrical Inspector

Stephen Thornton, Chief Electrical Inspector **Vol. 20 No. 10** **October 2017**

Question of the Month – The nameplate on an electric furnace is required to be marked with the minimum supply circuit conductor ampacity and the maximum rating of the branch-circuit short-circuit and ground-fault protective device. What are the most correct code references requiring branch-circuit conductors, and overcurrent protective devices for this equipment to be as stated on the nameplate? Hint – It is not National Electrical Code® (NEC®) 110.3(B). *See correct answer on Page 2.*

Safety Tip of the Month

Never leave energized conductors or equipment parts exposed. A missing cover on an energized electrical panel on a construction site can lead to tragedy. According to recent OSHA statistics, electrocution is the third leading cause of worker fatalities. Do not allow a serious unsafe condition such as exposed electrical wiring to ruin yours or someone else's life on your jobsite.

Plan Ahead – No Electrical Inspections on November 14 and 15

The department will be holding a two day training for all L&I inspectors. We regret the inconvenience this causes, but we have found that a statewide approach improves consistency and is the most efficient use of our training budget. Please let your customers know and plan for your inspections accordingly.

Proposed Changes to Sign and Residential Specialty Scopes of Work

The department has received two petitions from stakeholders to modify the (04) Sign and (02) Residential specialty workscopes. The (04) Sign specialty petition seeks to include energy efficient retrofitting of exterior luminaires that are mounted on a pole or other structure. Current language allows the sign specialty to service, maintain, or repair these luminaires with like-in-kind components, which prohibits modifications such as LED retrofits. The (02) Residential specialty petition seeks to allow residential specialty electricians and contractors to perform wiring in multi-family residential buildings based on the type of construction and the allowance in the NEC® for non-metallic sheathed cable in multi-family buildings. Currently, residential specialty electricians are limited to multi-family buildings not exceeding three stories above grade.

The department has begun the formal rulemaking process to consider input from all stakeholders regarding these issues. A special stakeholder meeting was held September 26 to discuss the proposals and provide an opportunity for stakeholders to give feedback to the department. The meeting was well attended and the concepts for the proposals were unanimously supported by all stakeholders responding. A draft of the proposed rule language will be posted on the *Rule Development* page of our website shortly. The proposals will be shared with the Electrical Board at their *October 26 meeting* in Spokane. After the department receives the board's advice regarding the proposals, a public comment period and hearing will be announced. For the latest developments on this and other rulemaking, watch for future announcements in this newsletter and the Rule Development page.

Wireless Security Systems – When is a Permit Required if Powered by Field Wiring?

Answer: Always. Most wireless security control panels installed today are powered by a field-terminated plug-in Class 2 power supply like the one pictured to the right. Contractors installing Class 2 low-voltage cable can use the Class B random inspection process as described in WAC *296-46B-908* or the regular permit and inspection process. A licensed telecommunications or electrical contractor must employ the installer. Because this kind of limited-energy interconnection is associated with a wireless telecommunications device, it is within the (09) telecommunications specialty and installers are not required to be certified electricians.

If a wireless control panel comes factory equipped with a manufactured power supply requiring no field terminations – similar to a laptop computer portable power supply and no cables are concealed, it is not a regulated electrical/telecommunications installation when no other wiring is installed.

Voltage Drop Calculations

The NEC®, according to 90.1(B) contains provisions that are considered necessary for safety, and provides requirements that result in an installation that is essentially free from hazard but not necessarily efficient, convenient, or adequate for good service or future expansion of electrical use. A good example of this is an informational note regarding voltage drop for branch circuits and feeders in 210.19(A). Although the NEC® does not require it, the informational note states for reasonable efficiency of operation, conductors for branch circuits should be sized to prevent a voltage drop not exceeding 3 percent at the farthest outlet, and the voltage drop on both feeders and branch circuits should be limited to 5 percent at the farthest outlet.

There is a need to establish some uniformity in the calculation method used for voltage drop problems. Like fault current calculations, there are several methods that may be used to arrive at a theoretical "voltage drop". Parameters considered can include conversion of DC resistance to AC impedance, internal cable structure, operating temperatures, and raceway material. Many of these calculations must be done on the jobsite where circuit conductor lengths and sizes are established during the installation. We base exam questions on the following (simplified) method we believe is best adaptable to the field when used as described.

The **VD=(2×K×I×L)÷wire circular mils** formula deals with only two (Al and Cu) conductor resistivity constants (K) in addition to one-way circuit length (L), load amps (I), and wire size expressed in circular mils (from NEC® Chapter 9, Table 8). The constant (K-resistivity in ohms per circular mil-foot) is assumed to be **12.9** for copper wire and **21.2** for aluminum wire. You can calculate these approximate values from Chapter 9, Table 8 **(ohms × kcmil) ÷ 1000 ft**. The K values are valid at 75°C (167°F) and constitute a conservative worst-case for the utilization of typical building wire. Though you may accurately adjust K or DC resistance for temperatures other than 75°C (167°F) and for the effects of AC self-induction, our basic electrical exam questions do not require this level of detail.

How to Avoid Employing People who do not Renew Their Certificates

At any given time, there are expired trainees, electricians, and administrators working for unknowing electrical contractors. This can lead to trouble for everybody for not following what the law requires. Often, forgetting or waiting to renew because they have not completed continuing education or basic classroom training is the cause. The department sends a reminder to all certificate holders when they are eligible to renew 90 days before they expire. It is easy to know whether your employees are working with active certificates by verifying their status at the *Verify a Contractor, Tradesperson or Business* page of our website. You may want to consider using a calendaring program to set a reminder 90 days prior to everybody's expiration date to alert you when certificates are eligible to be renewed.

If someone is looking for an approved class to fulfill their education requirements, you can refer them to the *Electrical Workers' Educational Requirements* page of our website.

Ugly Picture: *If viewing this document online, click on the picture to open a larger image.* Have a blown fuse and don't have a proper replacement? No problem. Just use a knife switch. An electrical contractor found this butter knife in a fusible disconnect switch on a farm. They were unable to find a current rating on this knife, and the arcing created by the knife damaged the fuse holders, so the farmer agreed to have it replaced.

Answer to Question of the Month: NEC® 422.10(A), and 422.11(A). You may apply the more specific requirements of Article 422 to an electric furnace, which meets the definition of an appliance in NEC® Article 100.